

Advancements in Delta Smelt Acoustic Tagging

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Abstract: Delta smelt, previously one of the most common resident pelagic fish in the San Francisco Estuary, have dramatically declined in abundance since the 1980s. In order to develop sound management and restoration strategies, critical data gaps concerning delta smelt life history, habitat requirements, and exposure to key environmental stressors need to be addressed. Detailed resolution of fish movement and activity over spatial and temporal scales can be achieved by acoustic telemetry. The aim of this study was to assess the feasibility of tagging adult delta smelt to advance the long-term goal of establishing an estuary-wide smelt acoustic telemetry system. Cultured adult delta smelt (age-1 and age-2) were injected with a low viscosity polyurethane resin in order to determine the volume and shape of the peritoneal cavity. Dimensions of adult delta smelt peritoneal cavities permitted the use of the smallest currently available acoustic transmitter as a prototype for production of dummy tags along a gradient of sizes and weights. Three differently sized transmitters and PIT (Passive Integrated Transponder) tags were surgically implanted into age-1 and age-2 delta smelt to evaluate survival, tag retention, and wound closure over 28 days. Handling and anesthesia did not affect the survival of delta smelt during the study period. Cumulative mortality of all fish implanted with tags was significantly higher than that of the untreated control group, and survival was a function of tag size/weight. However, survival in the PIT-tagged group approached 75% over the 28-day period, emphasizing the potential use of a small, injectable acoustic transmitter – currently under development by the US Army Corps of Engineers - for delta smelt field studies as early as 2014.

Statement of Relevance: This project is directly related to the IEP goals to investigate and evaluate the causes of the Pelagic Organism Decline (POD). This study was funded by the Bureau of Reclamation, with one of the deliverables being the presentation of findings at the IEP annual workshop.